

[illegible]

Enu

பேசு ஒரேயே
இரண்டு மணித்தியாலம்
Two hours

- * Answer **all** questions.
- * Write your **Index Number** in the space provided in the answer sheet.
- * Instructions are given on the back of the answer sheet. Follow them carefully.
- * In each of the questions from **1 to 50**, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct or most appropriate** and mark your response on the answer sheet with a cross (×) on the number of the correct option in accordance with the instructions given on the back of the answer sheet.

- Enu*

5. Which of the following statements regarding eukaryotic cell cycle is correct?

- (1) Crossing over takes place in metaphase of meiosis I.
- (2) Formation of chromatin occurs in G_1 phase.
- (3) DNA replication occurs in G_2 phase.
- (4) Nuclear envelope reforms during cytokinesis.
- (5) Formation of mitotic spindle begins in prophase.

6. ATP

- (1) is a nucleoside containing pentose sugar, adenine and phosphate groups.
- (2) can be produced by oxidative phosphorylation using solar energy.
- (3) hydrolyses to ADP releasing 30.5 kJ/mol of energy.
- (4) is formed in pyruvate oxidation through substrate level phosphorylation.
- (5) contains deoxyribose.

7. Which of the following is a characteristic of enzymes?

- (1) They do not alter the nature of end products.
- (2) They increase the activation energy of a reaction.
- (3) They are not substrate specific.
- (4) A small amount of enzyme is used up during the reaction.
- (5) Any part of the enzyme molecule can catalyze a reaction.

8. Some statements regarding biochemical evolution are given below.

P - Small organic molecules such as amino acids and nitrogenous bases were first formed in early oceans.

Q - Small organic molecules polymerized to form organic macromolecules.

R - Protocells contained nucleic acids enclosed in a membrane.

Which of the above statements is/are correct?

- (1) P only.
- (2) Q only.
- (3) P and Q only.
- (4) Q and R only.
- (5) P, Q and R.

9. Some features of organisms are given below.

Cellular Organization	Peptidoglycan	RNA Polymerase	Response to Streptomycin
A - Prokaryotic	P - Present	R - One kind	X - Growth inhibited.
B - Eukaryotic	Q - Absent	S - Several kinds	Y - Growth not inhibited.

Select the response that indicates the correct combination of above features for each of the organisms given below.

- (1) *Nostoc* - A, P, S, X
- (2) *Thermococcus* - A, P, R, Y
- (3) *Euglena* - B, P, S, X
- (4) *Mucor* - B, Q, S, Y
- (5) *Planaria* - B, Q, R, Y

10. Some structures seen among animals are as follows.

Protonephridia, mantle and nematocysts

Organisms showing each of the above structures in correct sequence are

- (1) *Obelia*, hook worm and *Fasciola*.
- (2) *Planaria*, slug and jellyfish.
- (3) *Taenia*, pin worm and *Obelia*.
- (4) *Fasciola*, earthworm and *Hydra*.
- (5) Sea cucumber, snail and *Obelia*.

11. Spike mosses can be considered to be more similar to seed plants than club mosses do due to the presence of

- (1) stems.
- (2) leaves.
- (3) heterospory.
- (4) strobili.
- (5) dominant sporophyte.

12. Several features seen among some chordates are as follows.

- A - Keratinized structures
- B - Internal fertilization
- C - Parthenogenesis
- D - Marine life

Which of the above features can be seen in the organisms of classes Reptilia, Aves and Mammalia?

- (1) A and B only.
- (2) A and C only.
- (3) B and D only.
- (4) A, B and C only.
- (5) A, B and D only.

13. Collenchyma cells differ from parenchyma cells because collenchyma cells

- (1) are non-living when mature.
- (2) have a large central vacuole.
- (3) have unevenly thickened cell walls.
- (4) are thickened with lignin.
- (5) are present in the vascular tissues of plants.

14. Shoot apical meristem

- (1) increases height and diameter of stem.
- (2) produces cells inwards and outwards.
- (3) is composed of parenchyma cells.
- (4) is composed of undifferentiated cells.
- (5) contributes to primary and secondary growth of stem.

15. Dissolving of solutes in water

- (1) increases water potential and solute potential.
- (2) decreases water potential and solute potential.
- (3) decreases water potential and increases solute potential.
- (4) increases water potential and decreases solute potential.
- (5) affects water potential and solute potential independent of each other.

16. Osmosis

- (1) occurs due to diffusion of water molecules through a permeable membrane.
- (2) occurs from a low water potential to a high water potential.
- (3) is an active process.
- (4) is the mechanism by which water enters root hairs from soil.
- (5) reduces pressure in the sieve tube at the source.

17. Chlorosis in older leaves may be caused due to deficiency of which of the following elements?

- (1) Mg and S
- (2) N and P
- (3) Cl and Fe
- (4) Mn and Zn
- (5) Mo and Ni

18. Seed of a fruit is developed from

- (1) egg cell.
- (2) central cell.
- (3) embryo sac.
- (4) ovule.
- (5) ovary.

19. Some plant hormones are given below

- A - Absciscic acid
- B - Cytokinins
- C - Ethylene
- D - Gibberellins

Of the above hormones, leaf senescence is promoted by

- (1) A and B only.
- (2) A and C only.
- (3) B and C only.
- (4) C and D only.
- (5) A, B and C only.

20. Examples for plants showing homosporous are

- (1) *Pogonatum* and *Nephrolepis*.
- (2) *Lycopodium* and *Selaginella*.
- (3) *Selaginella* and *Cycas*.
- (4) *Lycopodium* and *Gnetum*.
- (5) *Nephrolepis* and *Pinus*.

21. Mineral elements mainly required for maintaining acid base balance, nerve functioning and formation of bones in man in correct sequence are
(1) Mg, Fe and P. (2) P, K and Cl. (3) K, Na and I.
(4) Na, K and Cl. (5) Cl, Ca and P.
22. This question is based on the following.
A - Movement of lymph; contraction of cardiac muscle
B - Exchange of gases in capillaries; active transport
C - Clotting of blood; formation of thrombin
D - Transport of CO₂ in blood; participation of red blood cells.
In which of the above pairs, does the second contribute to the first?
(1) A and B (2) A and C (3) B and C (4) B and D (5) C and D
23. Four respiratory volumes of a resting person are as follows.
Inspiratory reserve volume = 2500 ml Tidal volume = 450 ml
Expiratory reserve volume = 1450 ml Residual volume = 1100 ml
Inspiratory capacity, functional residual capacity and vital capacity of this person in correct sequence are
(1) 2950 ml, 2550 ml and 4400 ml.
(2) 1900 ml, 1550 ml and 5050 ml.
(3) 2950 ml, 1900 ml and 4400 ml.
(4) 2550 ml, 3950 ml and 5050 ml.
(5) 2950 ml, 2550 ml and 5500 ml.
24. Which of the following excretory structures of animals opens into digestive tract?
(1) Green glands (2) Salt glands (3) Flame cells
(4) Malpighian tubles (5) Nephridia
25. Select the response that correctly indicates the part of the human brain and its function.
(1) Thalamus – regulation of appetite
(2) Hypothalamus – maintenance of posture
(3) Mid brain – coordination of visual reflexes
(4) Pons Varolii – regulation of sleep and awake cycles
(5) Cerebellum – initiation of fight or flight response
26. In the retina of the human eye, the cell layers are arranged from the choroid to vitreous humour respectively as
(1) epithelial layer, bipolar cells, ganglion cells and photoreceptors.
(2) photoreceptors, epithelial layer, ganglion cells and bipolar cells.
(3) epithelial layer, bipolar cells, photoreceptors and ganglion cells.
(4) ganglion cells, bipolar cells, photoreceptors and epithelial layer.
(5) epithelial layer, photoreceptors, bipolar cells and ganglion cells.
27. Stimulation of the sympathetic division of the autonomic nervous system in man
(1) decreases the rate of heart beat. (2) promotes digestion.
(3) constricts pupil of the eye. (4) stimulates urination.
(5) promotes ejaculation of semen.
28. The hormone that has a tropic effect and a non-tropic effect is
(1) TSH. (2) ACTH. (3) prolactin. (4) GH. (5) FSH.
29. Which of the following statements regarding asexual reproduction of animals is correct?
(1) It relies entirely on meiotic division.
(2) It may produce offspring with varied genotypes.
(3) It enhances the evolution of species in changing environments.
(4) It allows rapid multiplication of individuals from a single parent.
(5) New organisms can be developed from a sperm without fertilization.

- 30.** In the human skull,
- (1) vomer contributes to form the cranium.
 - (2) ethmoid and sphenoid bones are facial bones.
 - (3) zygomatic and parietal bones contribute to form the zygomatic arch.
 - (4) mastoid process of mandible articulates with temporal bone.
 - (5) maxillary and frontal bones contain sinuses.
- 31.** Hybrid vigour is
- (1) increased by breeding among genetically similar individuals.
 - (2) higher in parents than in their F_1 generation.
 - (3) achieved by increasing heterozygosity.
 - (4) maintained by breeding among hybrids.
 - (5) a result of interspecific hybridization.
- 32.** A function of topoisomerase is
- (1) sealing the gaps of DNA strands.
 - (2) unwinding the double helix of DNA.
 - (3) stabilizing separated DNA strands.
 - (4) relaxing the strain of overtwisted DNA strands.
 - (5) breaking the hydrogen bonds between DNA strands.
- 33.** Translation of eukaryotes differs from that of prokaryotes because it
- (1) does not start before transcription is terminated.
 - (2) occurs in the nucleus.
 - (3) uses UAG, UAA or UGA as stop signals.
 - (4) does not form polysomes.
 - (5) does not start at AUG codon.
- 34.** Which of the following responses indicates the biomes in increasing order of average annual rainfall/precipitation?
- (1) Arctic tundra, temperate grasslands, temperate broad leaf forests
 - (2) Temperate grasslands, savannas, tropical rain forests
 - (3) Deserts, Alpine tundra, northern coniferous forests
 - (4) Arctic tundra, chaparrals, savannas
 - (5) Tropical dry forests, chaparrals, Alpine tundra
- 35.** Select the response with three threatened organisms.
- (1) Bengal tiger, dodo, Sri Lankan elephant
 - (2) Black ruby barb, giant tortoise, woolly mammoth
 - (3) Tilapia, water hyacinth, blue magpie
 - (4) Giant African land snail, giant panda, Indian fly catcher
 - (5) Maha madu, Wesak orchid, dusky-striped jungle squirrel
- 36.** Which of the following international agreements may contribute to reduce global warming?
- A - Kyoto protocol
 B - Basel convention
 C - Montreal protocol
 D - Cartagena protocol
- (1) A only.
 - (2) A and B only.
 - (3) A and C only.
 - (4) A, B and C only.
 - (5) A, B and D only.

37. Which of the following statements regarding microorganisms is correct?
- (1) Almost all mycoplasmas are parasites of animals and plants.
 - (2) Fungi are chemoheterotrophs which show saprophytic or parasitic modes of nutrition.
 - (3) Purple non-sulphur bacteria utilize light as the source of energy and CO_2 as the source of carbon.
 - (4) Streptococcus bacteria divide in multiple planes.
 - (5) In cyanobacteria, nitrogen fixation is catalyzed by nitrogenase enzyme present in akinetes.
38. Some bacterial pathogens
- (1) produce phospholipase which contributes to invasiveness.
 - (2) produce endotoxins which are thermolabile lipopolysaccharides.
 - (3) use the capsule and pili to enter host tissue.
 - (4) obtain nutrients from host cells without altering the metabolism of the host.
 - (5) produce lecithinase that breaks down the cementing substance between cells.
39. Which of the following statements regarding the roles of microorganisms is correct?
- (1) When organic matter is mineralized by bacteria and fungi, oxygen, water and CO_2 are released.
 - (2) Methanotrophic microorganisms produce methane from ocean sediments.
 - (3) *Pseudomonas* sp. causes denitrification when oxygen is limited in soil.
 - (4) Rhizobia are free living nitrogen fixing bacteria in soil.
 - (5) All rhizosphere fungi are beneficial to plants.
40. Select the response which correctly indicates the disease and its causative microorganism.
- (1) Botulism – *Staphylococcus* sp.
 - (2) Tetanus – *Clostridium* sp.
 - (3) Cholera – *Shigella* sp.
 - (4) Dysentery – *Salmonella* sp.
 - (5) Typhoid – *Vibrio* sp.

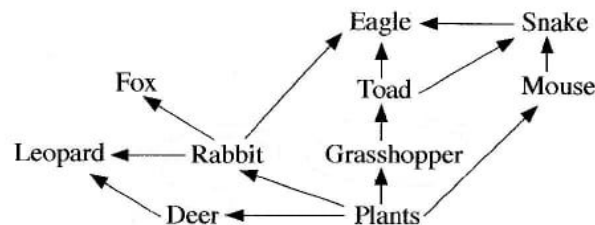
- For each of the questions 41 to 50, one or more of the responses is/are correct. Decide which response/responses is/are correct and then select the correct number.

- If only (A), (B) and (D) are correct (1)
 If only (A), (C) and (D) are correct (2)
 If only (A) and (B) are correct (3)
 If only (C) and (D) are correct (4)
 If any other response or combination of responses is correct (5)

Directions summarised				
(1)	(2)	(3)	(4)	(5)
(A), (B), (D) correct.	(A), (C), (D) correct.	(A), (B) correct.	(C), (D) correct.	Any other response or combination of responses correct.

41. Select the features that can be seen in the tissues of the respiratory system of man.
- (A) Single layer of plate like cells
 - (B) Single layer of cells of different heights
 - (C) Single layer of dice shaped cells
 - (D) Matrix with chondroitin sulphate
 - (E) Single layer of brick shaped cells
42. Three substances that the ingested food get encountered within the buccal cavity, stomach and small intestine of man in correct sequence are
- (A) lysozymes, pepsin and aminopeptidase.
 - (B) immunoglobulins, HCl and chymotrypsin.
 - (C) salivary amylase, dipeptidase and lipase.
 - (D) mucus, pepsin and bile.
 - (E) lysozymes, carboxypeptidase and amylase.

43. Some features of circulatory systems and examples for animals showing each of those features are given below. Select the correct "feature-example" combination/combinations.
- (A) No distinction between circulatory fluid and interstitial fluid – Centipede
 (B) Presence of pulmonary veins – Spider
 (C) Back flow of circulatory fluid into the heart via pores in the heart – Cockroach
 (D) Two chambered heart – Ray
 (E) Absence of blood capillaries – Carp
44. Antibodies
- (A) are proteins secreted by plasma cells.
 (B) are soluble forms of B lymphocyte antigen receptors.
 (C) contain epitopes that initiate immune responses.
 (D) inactivate pathogens in body fluids.
 (E) kill body cells infected with pathogens.
45. Which of the following cells in the testes of man are diploid?
- (A) Primary spermatocytes (B) Secondary spermatocytes (C) Spermatogonia
 (D) Leydig cells (E) Spermatids
46. In the human vertebral column,
- (A) 24 bones are linearly arranged.
 (B) cervical curvature develops at about 7–8 months after birth.
 (C) thoracic region is formed by 12 vertebrae.
 (D) cervical vertebrae contain foramen for vertebral arteries.
 (E) lumbar vertebrae contain bifid spinous processes.
47. Which of the following statements regarding the results of Mendel's experiments is/are correct?
- (A) F_2 generation of a monohybrid cross shows 3:1 phenotypic ratio.
 (B) Heritable factors of a dihybrid cross are located close to each other on the same chromosome.
 (C) Each heritable character is determined by two heritable factors.
 (D) Heritable factors of a dihybrid cross are located on two non-homologous chromosomes.
 (E) F_2 generation of a dihybrid cross shows 9:3:3:1 genotypic ratio.
48. Substitution of a single nucleotide in a DNA sequence may result in
- (A) silent mutation. (B) shift in the reading frame.
 (C) formation of a shorter peptide. (D) cancer.
 (E) shortening of gene.
49. This question is based on the food web given below.



In the above food web, the organisms that can be considered as in the same trophic level are

(A) eagle and snake. (B) leopard and fox. (C) toad and mouse.
 (D) toad and eagle. (E) grasshopper and leopard.

50. Which of the following statements regarding drinking water treatment process is/are correct?
- (A) Alum is added to remove suspended matter and microorganisms.
 (B) Ozone is used to kill microorganisms.
 (C) During filtration stage, microorganisms are removed by absorption into sand particles.
 (D) Trickling filter method is used to filter microorganisms.
 (E) During the primary treatment, about 90% of organic matter is removed.